

REMARKS

Reconsideration of the instant application is respectfully requested. The present amendment is responsive to the Office Action of August 19, 2005, in which claims 1-21 are presently pending. Of those, claims 1-6 have been rejected under 35 U.S.C. §102(c) as being anticipated by U.S. Patent 6,787,460 to Lee, et al. In addition, each of claim 1-21 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication 2004/0091789 by Han, et al., in view of either U.S. Patent 6,797,620 to Lewis, et al. or Lee, et al. For the following reasons, however, it is respectfully submitted that the application is now in condition for allowance.

As an initial matter, the informalities in the specification discussed on page 2 of the Office Action have been addressed by the above amendments to the specification, and it is respectfully requested that the same be withdrawn.

In the present amendment, the Applicants have cancelled independent claims 1 and 7 and have rewritten dependent claims 2 and 8 into independent form. The dependencies of claims 5, 6, 11, 12 and 14 are correspondingly amended.

With regard to the art of record, the Applicants respectfully traverse the §102 rejections of claims 2-6 for the reason that Lee does not teach or disclose "etching said second layer with a resulting pattern defined by said etched first layer plus said additive material" as is presently claimed.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). However, a review of the Lee reference reveals although a metal layer is electroplated onto sidewalls of a recess formed in a surface of an insulating layer, there is no subsequent etching step for etching into a second layer using the resulting pattern

defined by the etched insulating layer plus the electroplated metal layer thereon. This is not surprising, since the Lee reference is directed to methods of forming metal wiring layers within integrated circuit devices. (Lee, Abstract) Because the electroplating in Lee is performed for the purpose of preventing voids in metal lines formed by damascene processing (col. 1, lines 15-37), there is no reason to use the side-plated metal as part of a mask pattern for further etching.

Therefore, because Lee does not expressly or inherently teach or describe each and every element of claims 2-6, the reference does not anticipate the same and therefore the §102 rejections thereto should be withdrawn.

With regard to the §103 rejections of claims 2-6 and 8-21, the Applicants also respectfully traverse the same, for the reason that (i) the combination of the teachings of Han with either Lewis or Lee does not result in all of the claimed elements; and (ii) one skilled in the art would not, in the first place, be motivated to combine the teachings of Han with either Lewis or Lee.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that (1) all elements of the claimed invention are disclosed in the prior art; (2) that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references; and (3) that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

With regard to the second element, there are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of

the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999). Furthermore, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

A statement that modifications of the prior art to meet the claimed invention would have been “ ‘well within the ordinary skill of the art at the time the claimed invention was made’ ” because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000).

Although the Han reference discloses a reflective EUV mask and method of manufacture, the particular focus therein is the formation of phase shifting masks (PSM) as a solution for patterning small device features on semiconductor wafers. (Han, paragraphs [0014]-[0015]) As a result, the mask structure and methodology differs from the present claims. On page 4 of the Office Action, the Examiner indicates that the teachings of Han “differ from those of the applicant in that the applicant teaches electrochemically depositing an additive material on exposed sidewalls of an etched absorber layer of the mask.”

However, the Applicants respectfully submit that the teachings of Han differ from the present claims by more than just indicated by the Examiner. As is the case with the Lee reference, Han does not teach or disclose “etching said second layer with a resulting

pattern defined by said etched first layer plus said additive material” as recited in claim 2. More narrowly, Han does not teach or disclose “etching said buffer layer with a resulting pattern defined by said absorber first layer plus said additive material” as recited in claim 8. In the instant claims, the additive material is formed on the absorber layer 108 and the corrected features are then patterned (etched) into the buffer layer 106.

As is shown in Figures 2-5 of Han, the absorber layer 32 is formed over an upper reflective layer 22, and over an opening 26 formed in the upper reflective layer, and onto an etch stop layer 20. A resist 34 layer is formed and patterned over the portion of the absorber layer 32 deposited in the opening 26, and the remainder of the absorber layer 32 is removed to result in the structure of Figure 5. Thus, not only is the absorber layer 32 not provided with an additive layer on the sidewalls thereof, Han also does not teach or suggest etching a buffer layer (or any layer for that matter) using the a pattern defined by the absorber layer plus the additive material. In other words, the pattern of the absorber layer 32 in Han formed within opening 26 is not subsequently etched into the layer 20 below. Therefore, even if the teachings of Han were combined with either Lewis or Lee for the purpose of adding a plated material on the sidewalls of the absorber layer, the claimed invention does still not result because Han does not etch the absorber layer pattern into a second layer. Accordingly, the combination of Han with either Lewis or Lee does not result in all of the claimed elements of claims 2-6 and 8-14.

Furthermore, one skilled in the art would not be motivated to combine the teachings of Han with either Lewis or Lee. As indicated above, Han is directed to manufacturing a mask used for EUV lithography, whereas Lee is directed to avoiding the formation of voids in metal layers used in the formation of integrated circuit devices. Similarly, Lewis teaches ways for improved electroplating of apertures formed semiconductor substrates. In this sense, Lewis is similar to Lee in that they both teach the formation of additive materials on sidewall surfaces. However, with respect to Han, nothing therein teaches or suggests any need or reason for providing an additive material on any surfaces of the layers used in forming the PSM masks.


In the present application, it is recognized that with present technology, smaller critical dimensions (CD) for the mask features may not be attained during mask production, leaving the manufacturer no other choice but to scrap the mask. (specification, p. 2-3) Accordingly, the inventive solution disclosed herein is to essentially repair a mask that initially fails to meet a CD target by using an additive material on the absorber sidewalls to decrease the linewidth of the mask features. In contrast, the focus of Han is to simplify the EUV mask manufacturing process by using a subtractive process to directly pattern the reflective layer itself, rather than an additive process of forming and patterning multiple layers over the reflective layer. (Han, paragraph [0014]) There is no mention therein of repairing dimensions that have been formed too large or any other suggestion that one or more of the mask layers would need material added to the sidewalls thereof to correct for improperly sized patterning.

Therefore, because one skilled in the art would not be motivated to combine Han with another reference (i.e., Lewis or Lee) that teaches sidewall material addition, the §103 rejections to claims 2-6 and 8-21 have also been overcome, and it is respectfully requested that each of the same be withdrawn.

For the above stated reasons, it is respectfully submitted that the present application is now in condition for allowance. No new matter has been entered and no additional fees are believed to be required. However, if any fees are due with respect to this Amendment, please charge them to Deposit Account No. 09-0458 maintained by Applicants' attorneys.

Respectfully submitted,
LOUIS M. KINDT, ET AL.

CANTOR COLBURN LLP
Applicants' Attorneys

By 
Sean F. Sullivan
Registration No. 38,328
Customer No. 29371

Date: November 9, 2005
Address: 55 Griffin Road South, Bloomfield, CT 06002
Telephone: (860) 286-2929